SIDE EVENT
THE FOOD COLD CHAIN: SOLUTIONS FOR SUSTAINABLE COMMERCIAL REFRIGERATION
7th November 2019 – MoP31

Presentation of natural refrigerant technologies and energy saving

Francesco Mastrapasqua
ASSOCOLD
Refrigeration Technologies Manufacturers Association
EU targets CLIMATE NEUTRALITY within 2050 and tracks the progress towards the long-term goal through a robust transparency and accountability system, particularly assessing the potential impacts of new policies.
THE F-GAS REGULATION

F-Gas Regulation 2020 requirements:

- Hermetically sealed commercial refrigerators and freezers must have GWP<2500 (<150 in 2022)
- Stationary refrigeration (except below 50°C) must have GWP<2500
- Servicing refrigeration with virgin F-gases only if GWP<2500
- Movable air conditioning must have GWP<150
- Extruded polystyrene foams with HFCs must have GWP<150

- HFC tax in France, Spain, Norway and Denmark
- DPR 146/2018 with new reporting requirements and licensing system for HFCs usage
REFRIGERANTS REGULATORY SCENARIO

Supply
The supply of HGWP refrigerants is dropping
There is little quota only for LGWP refrigerants
GWP must be below 300 average from 2021

Pricing
Mid-high GWP refrigerants prices have risen
+500/+1000% (vs 2014 levels)
Natural refrigerants price low and stable
CO2 BASED NATURAL REFRIGERATION SYSTEMS

Availability
800+ suppliers & 250+ training providers in Europe
23,000+ food retail stores (500+ in Italy)
Mainly in NEW supermarkets > 400m² (18%)

Cost-Evolution for CO₂ systems*

*%: costs vs. HFC/HFO
HFC...hydrofluoro-carbon refrigerant  HFO...hydrofluoro-olefin refrigerant

<table>
<thead>
<tr>
<th>Year</th>
<th>Components</th>
<th>2008</th>
<th>2012</th>
<th>2016</th>
<th>2019</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>compressors</td>
<td>150%</td>
<td>140%</td>
<td>130%</td>
<td>115%</td>
</tr>
<tr>
<td></td>
<td>controller</td>
<td>120%</td>
<td>120%</td>
<td>110%</td>
<td>100%</td>
</tr>
<tr>
<td></td>
<td>valves</td>
<td>150%</td>
<td>130%</td>
<td>120%</td>
<td>110%</td>
</tr>
<tr>
<td></td>
<td>other components</td>
<td>140%</td>
<td>120%</td>
<td>110%</td>
<td>100%</td>
</tr>
<tr>
<td></td>
<td>piping</td>
<td>160%</td>
<td>160%</td>
<td>110%</td>
<td>110%</td>
</tr>
<tr>
<td></td>
<td>gas cooler</td>
<td>135%</td>
<td>125%</td>
<td>110%</td>
<td>105%</td>
</tr>
<tr>
<td></td>
<td>evaporators</td>
<td>135%</td>
<td>125%</td>
<td>115%</td>
<td>105%</td>
</tr>
<tr>
<td></td>
<td>installation</td>
<td>170%</td>
<td>160%</td>
<td>120%</td>
<td>100%</td>
</tr>
<tr>
<td></td>
<td>engineering</td>
<td>180%</td>
<td>150%</td>
<td>120%</td>
<td>90%</td>
</tr>
<tr>
<td></td>
<td>display cabinets</td>
<td>140%</td>
<td>120%</td>
<td>100%</td>
<td>90%</td>
</tr>
<tr>
<td></td>
<td>total</td>
<td>148%</td>
<td>135%</td>
<td>115%</td>
<td>103%</td>
</tr>
</tbody>
</table>

Costs CO₂ vs. HFC/HFO systems
ENERGY SAVING IN COMMERCIAL RETAIL

LED lights
Reliability
Lifetime up to 100,000 hours (around 20 years) and keep their luminous flux intact for about 40,000-60,000 hours (10-12 years)
Efficiency
LED lamps are less affected by the ambient temperature and their efficiency loss in cold environments is 25% (30% less than T5)
Energy saving
From 40 to 80% with same light output
Less maintenance

Passive doors
Reduction of the thermal load
the evaporation temperature is increased up to +2K and the HER reduced (10%).
No mist during opening
Without resistors both in the frame and in the windows, thanks to the Argon gas insulation there is no condensation at nominal conditions (25°C/60% R.H.)
Low energy consumption
The reduction in direct electricity consumption can be up to 45%
Adaptive resistor control
Adapts the power to the environment
The sensor detects the temperature on the surface of the doors and the environmental conditions in the sales area. The control modulates the power to the resistor to keep the doors clean.
System can be installed also as a retro-fit
Solution consisting of 2 probes and an independent control system installed on the top of the display cabinet.
Energy saving for quick pay-back (-50%)
ENERGY SAVING IN COMMERCIAL RETAIL

EC fans at condenser / gas cooler
Stepless fan speed adjustment
The integrated regulation system with inverter allows to control the fan speed setting the revolutions according to the load and the external temperature (10 to 100%)
Increase in efficiency
Rotors and blades are designed to optimize efficiency allowing the recovery of dynamic pressure and air flow straightening.
Low energy consumption
EC fans allow 15 to 30% savings depending on the blade profile and the conveyor used.

Electronic expansion valves
Optimal evaporator efficiency
The shape of the shutters, the length of the run, the use of high precision mechanical components together with best in class electronic controls increase the efficiency of the entire refrigeration system.
Constant temperature of the goods
Certified according to regulations, they guarantee maximum product quality and reliability over time.
Compressors with capacity control
The controller continuously sets the compressor speed via inverter (frequency control) or other devices and the cooling capacity compressor can be increased by about 70% compared to the fixed speed of the compressor at 50 Hz.

Cooling capacity control
The cooling capacity provided as well as the absorbed power follow the actual load of display cases, freezers and cold rooms

Energy saving
Less start-ups of the compressor, greater thermal stability of the system and better flexibility of use.

Floating condensing temperature (HFC)
Adaptive operation: floating set-point
The controller regulates the condensation temperature according to the ambient conditions and the temperature in the sales area, the modulation is constant and adaptive, reducing consumption.

Central efficiency improvement
Efficiency improves by adapting condensation according to the outside temperature, in all seasons and any time of the day and night.
ENERGY SAVING WITH CO$_2$ SYSTEMS

- FTE Full Transcritical Efficiency
- Subcooler
- Parallel compression
- Evaporative cooling
- Heat Reclaim & AC integration
- Ejectors
HC REFRIGERATED DISPLAY SHOWCASES

**Availability**

Widely used in light commercial refrigeration (8+ million units globally) and in food retail (3,2+ million units)

Use of HCs in larger equipment will help the future growth but the updated IEC 60335-2-89 needs to be urgently translated into national standards

---

**Waterloop and hybrid products**

2,500+ installations using HC waterloop

Efficiency, always at best working condition

Lower installation and maintenance costs

Better use of building facilities

Easy integration with comfort heating
SAVINGS – How do you compare?

R448A/R449A systems
Self contained plug-ins
TSC - CO2 transcritical
TSC+FTE - CO2 with supersaving technologies

- Evaporating temperature increased
- Energy savings are somehow independent of external temperatures
- Optimal Seasonal Performance
- No MT superheat, decreased discharge temperature, better heat transfer rate, lower installation costs ....
MONITORING AND OPTIMIZING NR SYSTEMS

Not only data but TREATED data

1) Data collection
2) Normalization
3) Data quality
4) Aggregation & Correlation
5) Usage binding
6) Dashboards, reports, alarms, Excel Export, PDF prints

Business Systems (MES, ERP,...)

Data sources
- Web services
- IoT
- BACNet
- Modbus
- OPC
- Carel
- Danfoss
- Wurm
- Simatic
- And others...
MONITORING AND OPTIMIZING NR SYSTEMS

Compare by time quickly and easily

Compare objects quickly and easily

Export data quickly and easily

Use KPIs in dashboards instead of kWh only

Report statistics
- Overview consumption with last month, month before and month one year ago
- Overview consumption, temperature and humidity last 12 weeks
- Alarm overview
- Events day/night
- Events closed with local intervention
- Alarms by cold location type
- Top 10 markets / events / devices
- Market summary
“I will propose a Climate Law, within 100 days of taking office, to enshrine in legislation the EU’s 2050 climate neutrality objective. This law will set the long-term direction of travel for all our policies.”

“I will also start work immediately to deliver a higher level of ambition for 2030; and as soon as possible I will put forward legislative proposals that will help us to reduce emissions by at least 50%, or even better by 55%.”

Executive Vice President-designate Frans Timmermans
EP Hearing on 08/10/2019
ASSOCOLD is the Italian Association, federated to ANIMA Confindustria Meccanica Varia, which represents the Manufacturers of Refrigeration Equipment.

Thanks to its experience, competence and representativeness, Assocold is the reference and consultation point for the development of legislative provisions.

Assocold supports companies through its institutional presence on international markets, participates in the most important trade fairs, organizes trade missions and promotes its associates through the dissemination of information material.

In ASSOCOLD you will find:

• The players in your industry belonging to ANIMA
• An association that represents, informs and keep you updated
• Support to certification programs
• Qualified technical training and market information
• Development of standards, laws, technical documentation
• Constantly updated on technical news
• Technical support / interpretation / FAQ of interest
• Assistance for the interpretation and application of regulations concerning industrial sectors and products
• Qualified technical training
• Legal Service
• Interpretation of measures affecting business
• Development of strategic business partnerships
• Organization of institutional, promotional and thematic events
ASSOCOLD holds institutional long-term relations with:
- Ministero dello Sviluppo Economico
- Ministero della Salute
- Ministero dell’Ambiente e della Tutela del Territorio e del Mare
- Ministero degli Affari Esteri e della Cooperazione Internazionale
- ENEA Agenzia Nazionale per le nuove tecnologie, l’energia e lo sviluppo sostenibile
- ATS Agenzia di Tutela della Salute (ex - ASL)
- ISPRA Istituto Superiore per la Protezione e la Ricerca Ambientale
- INAIL Istituto Nazionale per l’Assicurazione contro gli Infortuni su Lavoro
- Istituto Superiore di Sanità
- ICE Agenzia per la Promozione all’Estero e l’Internazionalizzazione delle imprese italiane
- Camere di Commercio
Thank You!

Francesco Mastrapasqua  President
Ryoko Tamada  Association Manager

ASSOCOLD – Associazione Italiana Costruttori Tecnologie per il Freddo

SIDE EVENT
THE FOOD COLD CHAIN: SOLUTIONS FOR SUSTAINABLE COMMERCIAL REFRIGERATION